

COASTAL POLLUTION

*Effects on
Living Resources
and Humans*

Carl J. Sindermann



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Living Resources
and Humans*



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Boca Raton London New York

A CRC title, part of the Taylor & Francis imprint, a member of the Taylor & Francis Group, the academic division of T&F Informa plc.

Published in 2006 by
CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

© 2006 by Taylor & Francis Group, LLC
CRC Press is an imprint of Taylor & Francis Group

No claim to original U.S. Government works
Printed in the United States of America on acid-free paper
10 9 8 7 6 5 4 3 2 1

International Standard Book Number-10: 0-8493-9677-8 (Hardcover)
International Standard Book Number-13: 978-0-8493-9677-9 (Hardcover)
Library of Congress Card Number 2005051483

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Library of Congress Cataloging-in-Publication Data

Sindermann, Carl J.

Coastal pollution: effects on living resources and humans / Carl J. Sindermann.
p. cm. -- (Marine science)

Rev. and enl. ed. of: Ocean pollution. 1996.

Includes bibliographical references and index.

ISBN 0-8493-9677-8

1. Marine animals--Effect of water pollution on. 2. Seafood--Contamination. I. Sindermann, Carl J. Ocean pollution. II. Title. III. Marine science series.

QL121.S62 2005

577.7'27--dc22

2005051483

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is the Academic Division of Informa plc.

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<http://www.taylorandfrancis.com>

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Dedication

*I would like to dedicate this new edition to my dear wife,
Joan, who has been and continues to be my severest critic
and my most enthusiastic supporter.*

Prologue: Menace of the Sludge Monster

Environmental crises are daily events in the New York metropolitan area and its much-abused adjacent waters. During the late 1970s and early 1980s, when human concerns about degradation of the planet were still in their ascendancy, the news media gave unusual attention to problems created by an ocean dumpsite just 12 mi southeast of New York City, where stupendous quantities of sewer sludge, contaminated dredge spoil, toxic industrial wastes, and construction rubble were deposited every day. But it was the sewer sludge — some 5 million tons of it being dumped every year — that particularly fascinated the news people (see Figure P.1).

The dumping had created a zone on the ocean bottom that was deficient in most forms of marine life and was therefore labeled “the dead sea.” Bottom samples contained all that is awful about our society’s offal but little evidence of life forms, except for a few species of pollution-resistant worms and luxuriant populations of microbes. Furthermore, the sludge was found by scientists to have accumulated to appreciable depths near the dumpsite. Some imaginative reporter with headline possibilities in mind extrapolated the scientific observations to a “sludge monster” lurking just off the coast. To many people the monster was almost real, with a sinister energy derived from the ocean currents. It was out there — huge, black, and menacing — just beyond the surf zone, poised to overwhelm the already marginal beaches of Long Island and New Jersey, ready to make them totally unacceptable for any further human presence.

During the long hot summers of that traumatic period from 1976 to 1984, the state (New York and New Jersey) departments of health and environmental protection and the federal Environmental Protection Agency (EPA) were called upon repeatedly to examine what seemed to be early warning signs of the feared sludge invasion, in the form of slimy blobs deposited on the beaches by the tides. These ugly masses (referred to as “tar balls” or “waste balls”) were identified consistently by the regulatory and public health agencies as “innocuous material,” “decaying mats of algae,” or “aggregates of weathered oil,” and *not* of human fecal origin — but savvy metropolitan beachgoers knew better. They were not about to be conned by the so-called experts, and many stayed away from those suspect shores. Each year during that time (1976 to 1984), the “sludge monster” frenzy peaked in summer and then dissipated with the onset of cool weather and the withdrawal of people from the beaches, only to reappear in the following spring. But, unaccountably, the major invasion never came. By 1985, there were fewer reports of sludge-like contaminants on the beaches, and talk of the sludge monster began to recede from the morning news.

This relative calm was shattered in the summers of 1987 and especially 1988 by a new coastal crisis: sightings of quantities of medical wastes (including bloody



FIGURE P.1 High-altitude photograph of the inner New York Bight, taken in 1977. The dark streaks in the center are surface residues of ocean dumping, after barges have deposited their noisome cargoes.

hospital dressings and used syringes, some containing HIV-positive blood) cast up on a number of bathing beaches of New Jersey and New York, probably as consequences of illegal dumping in coastal waters or equipment failures in municipal sewage treatment facilities. News accounts, including graphic photographs of this revolting new form of shoreline pollution, drove masses of people from the beaches during those dismal summers. The obscene combination of sludge and medical wastes was just too much to tolerate, even for hardened urban sensitivities.

But the medical waste furor also dissipated quickly, leaving only a small residue of heightened vigilance among the few who persisted in visiting those mean shores of the New York Bight. The news media moved nimbly to other crises, helicopter surveillance flights and water sampling surveys by the regulatory agencies were reduced or eliminated, and the coastline slumped back to its usual blighted normalcy. Sludge dumping was, however, banished by EPA from the 12-mi dumpsite to a location 106 mi seaward of New York City, on the edge of the continental shelf, late in 1988, and was officially terminated even there in 1992. Undoubtedly, the sludge monster publicity, regardless of its validity, contributed significantly to attempts by environmental activist groups to stop ocean dumping.

Some day in the distant future, the 12-mi dumpsite will be a rich source of information for cultural anthropologists — a thin black layer of compressed sediments rich in fossilized artifacts that illustrate the nadir of human abuse of the edges of the sea in the 20th century, just offshore of the site where New York City used to stand. Those scientists of the future will never know the excitement and the dread generated by the sludge monster whose essence is captured in those sediments, but the physical evidence will be appalling enough for all time.

From *Field Notes of a Pollution Watcher*
(C.J. Sindermann, 1993)

Preface

Late in the year 1970, a major turning point occurred in my scientific career: I joined the staff of a federal fisheries research center at Sandy Hook, New Jersey. One of the principal programs of that center was to examine the effects of coastal pollution on productive systems of the oceans, especially effects on fish and shellfish resources. The Sandy Hook Laboratory, one of the operating units of the center, was ideally located for such a program, positioned as it was on a sandspit within sight of the smog-dimmed skyline of New York City, at the mouth of the grossly polluted Hudson River. Two important factors added to the logic of doing pollution research there: first, 12 mi seaward of the laboratory was the largest sewer sludge dumpsite on the east coast of the United States, and, second, industrial as well as sewage effluent pipes were (and still are) abundant along the immediate coastline.

One of the most fascinating aspects of this research assignment was that, in the presence of all this degradation from human population pressures and industrial pollution, fish and shellfish stocks existed and were objectives of vigorous sport and commercial fisheries. Several laboratory programs examined the reproduction, life cycles, and abundances of these stressed species, and, when integrated with the ongoing pollution studies, provided a superb opportunity to assess impacts of humans on living resources.

After more than a decade characterized by intense learning experiences about effects of coastal pollution in that unusual research venue, I left Sandy Hook for a briefer assignment in Miami, Florida — also a coastal area troubled by too many people living too close to the ocean. One of the results of those back-to-back research exposures to damaged marine environments and their effects on fish and shellfish was great internal pressure to write a book that would provide its readers with some insights into the history and consequences of human-related modifications of coastal/estuarine waters.

In response to that internal pressure, I published a book in 1996 titled *Ocean Pollution* — a somewhat technical document with a living resource perspective and a persistent emphasis on pathological effects of coastal pollution. The publication you have in hand is an expansion and extensive revision of that earlier book, written with an attempt at greater translucency, while still preserving some of the technical aspects and most of my favorite vignettes about life and death in disturbed marine habitats. After several unsatisfactory earlier drafts, I have settled on what might be described as a semihistorical episodic approach, with a fragile structure based (in Section I) on exploration of eight specific horror stories that have emerged partly as consequences of coastal pollution. Section II considers effects of coastal pollution on resource species and marine mammals, and Section III is concerned with effects of coastal pollution on humans.

Because few people ever read a technical book like this one from cover to cover (and rightly so, for it is, after all, not a novel), I offer seven options:

For the dilettante: Skip lightly through the italicized vignettes in each chapter, and ignore the rest of the text. This approach will give a soupçon — a tiny taste — of the flavor and content of the entire document.

For the casual reader: Read the introductory and concluding chapters, and maybe some of the vignettes; then put the book aside for future reference.

For the selective reader: Look at the table of contents, read only those chapters that seem to be of immediate and compelling interest, and ignore the rest.

For those with wide interests but short attention spans: I recommend a subset of thrillers from Section I, Chapter 1 through Chapter 8.

For resource-oriented people: Focus immediately on Section II, Chapter 9 through Chapter 11.

For those interested in the effects of coastal pollution on humans: Turn to Section III, Chapter 12 through Chapter 14.

For my favorites, the dedicated readers: Read the introduction and follow the chapter sequence in an orderly fashion through to the end. Good luck!

For all readers, I especially urge attention to the more robust and meaty chapters — Chapter 8, “Biological Pollution: Invasions by Alien Species”; Chapter 10, “Effects of Coastal Pollution on Yields from Fish and Shellfish Resources”; and Chapter 12, “Effects of Coastal Pollution on Public Health.” From my perspective, these three chapters carry the book, at least in terms of scientific content.

I have resolved, in this revised edition, to include small dabs of history in the anecdotes and the narrative. I do this in part out of conviction that there is too much “now” in today’s science and too little “then.” I made this profound discovery because of my almost lifelong habit of reading technical journals. At some vague time just before the advent of the new millennium, I began to notice that over 90% of literature citations in the national journals that I read were for papers published *after* 1990 — as if science had appeared by an act of immaculate conception or spontaneous generation during that magic year. Now I recognize that science stumbles along (or maybe races along) at a variable pace in different subdisciplines, but something is wrong here. Science consists of more than today’s victories or defeats — it has a long history of successful or failed efforts by countless very good, mediocre, or poor investigators. That history should have some greater recognition by current practitioners, at least in their own journals.

Science practiced without occasional genuflection to its history is too flat and featureless — intense but without depth — stimulating but lacking an important link with the past. We can do better.

I have walked the surface of this planet for enough years now to have discerned phases and trends in the improvement of understanding about coastal pollution. A few that could be mentioned are: the unfolding of knowledge, beginning in the 1950s, about the major role of *Vibrios* in coastal/estuarine waters; the realization, beginning in the 1960s and 1970s, that industrialization and industrial effluents were having significant chemical impact on those same waters (witnessed by such events as Earth Day in 1970 and the great Japanese fish riots of 1973); the more recent realization that nutrient chemicals of human origin (phosphorus and nitrogen in

particular) were beginning to unbalance coastal ecosystems; and the findings that persistent toxic chemicals (such as DDT and PCBs) are now global in their distribution, with total effects still not fully understood.

Before plunging ahead, I would like to acknowledge the great benefits of long-term discussions about coastal pollution with Dr. John B. Pearce, formerly with the National Marine Fisheries Service, Woods Hole, Massachusetts, and now Director of the Buzzards Bay Marine Laboratory in Falmouth, Massachusetts.

I also thank the directors, past and present, of the NOAA National Ocean Service's Cooperative Oxford Laboratory (COL) in Oxford, Maryland, for encouraging completion of this long manuscript — recognizing that statements and conclusions in it are my personal responsibility. The manuscript was not reviewed by NOAA, so no official endorsement should be inferred.

I especially thank Mrs. B. Jane Keller, Editorial Assistant, COL, for professional help in the almost endless process of preparing a book manuscript for publication. Her assistance has been critical in bringing us to the present stage.

I also have special thanks for Dr. Aaron Rosenfield, Emeritus Director of the Laboratory, for many useful comments on earlier drafts, and for Mrs. Electa Pace of the University of Miami for advice, comments, and encouragement.

Finally, I would also like to acknowledge the hospitality of the Commonwealth of Massachusetts, for providing facilities for writing and contemplation at South Pond in the Savoy Mountain State Forest high in the northern Berkshires. Without drawing too many gratuitous parallels, South Pond is in many of its characteristics the present-day equivalent of the well-known but now despoiled Walden Pond (located in the eastern part of the Commonwealth) as it was more than a century and a half ago, during Henry David Thoreau's tenancy there.

Carl J. Sindermann
Oxford, Maryland

The Author

Dr. Carl J. Sindermann grew up in the western Massachusetts town of North Adams. During World War II, he served as a medic in an infantry reconnaissance platoon of the 26th (Yankee) Division, with combat experience in France, Luxembourg, Belgium, Germany, and Austria. He was awarded a bronze star medal in action during the Battle of the Bulge.

He received a Bachelor of Science degree with honors in zoology from the University of Massachusetts in 1949 and then an A.M. and Ph.D. in Biology from Harvard University in 1951 and 1953. During the latter part of his graduate program, he was a teaching assistant in parasitology in the Department of Tropical Public Health at Harvard Medical School. Later in his career, he also received an honorary Doctor of Science degree from Monmouth University in recognition of his contributions to marine environmental sciences.

His research specialties have been in the parasitology of marine animals and the effects of coastal pollution on living resources and on humans. He has published more than 150 scientific papers, as well as six technical books and several edited volumes in marine sciences. His principal contribution to the scientific literature was a thousand-page, two-volume book titled *Principal Diseases of Marine Fish and Shellfish*, published by Academic Press in 1990. One of his books (*Principal Diseases of Marine Fish and Shellfish*) received an outstanding scientific publication award from the Wildlife Society of America, and another (*Winning the Games Scientists Play*) was cited by *Library Journal* as one of the best sci-tech books of the publication year.

He has published technical books on such varied topics as coastal pollution, diseases of marine animals, marine aquaculture, drugs and food from the sea, anoxia in coastal environments, and sea herring of the western North Atlantic. Additionally, in another genre, he has published books about scientists at work, with titles such as *Winning the Games Scientists Play*, *The Joy of Science*, *Survival Strategies for New Scientists*, *The Woman Scientist*, and *The Scientist as Consultant*.

During the course of his scientific career, Dr. Sindermann was for several of his early professional years a member of the teaching faculty of Brandeis University in Waltham, Massachusetts, and, later, an adjunct professor at Cornell University, Georgetown University, University of Guelph (Canada), University of Rhode Island, and University of Miami.

Two decades of his scientific career were occupied principally with administration of ocean research laboratories of the federal government — first as director of the Oxford Biological Laboratory, Oxford, Maryland, then as director of the Tropical Atlantic Biological Laboratory, Miami, Florida, and then as center director of the Middle Atlantic Coastal Fisheries Center, Highlands, New Jersey. During his tenure

as center director, he received the U.S. Department of Commerce Silver Medal for effective leadership of geographically dispersed research facilities.

Throughout his administrative career, he participated actively in the affairs of several international scientific organizations; he served terms as board member and then president of the World Aquaculture Society; he was for more than a decade chairman of the International Council for the Exploration of the Sea's Working Group on Introductions of Nonindigenous Species; he served as scientific advisor for the United Nations FAO Central West African Fisheries Commission; and he was a long-term member of the U.S.–Japan Joint Panels on Aquaculture.

Also during his research administrative career, Dr. Sindermann served for four years as scientific editor for the National Marine Fisheries Service and editor of the highly respected journal *Fishery Bulletin*. He also served on the editorial boards of other technical journals.

Since his retirement in 1991, he has continued his technical and nonfiction writing, publishing four additional books during that time.

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